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An Encouraging Start

We congratulate the Government upon their decision to rescind numerous Orders, affecting the relaxation of controls embracing more than sixty commodities. Included amongst these are the Main Machinery, Plant and Appliances Orders (631/1945). There is to be a tacit understanding for concerns making such products that from December 1 they will require no licence, and therefore will continue to do their best to maintain the export percentage at the present level. The significance of this new step is indicated by the fact that it involves the elimination of the issue of some 200,000 licences or permits a year. Where control by licence has been retained in fields allied to those now freed, it is on account of the dollar position being affected either by purchase of scarce raw materials or by anticipated sales to hard-currency countries. Thus the manufacture of lawn mowers, laundry plant, pianos (involving pianoforte frames) and refrigeration machinery is unaffected.

The repercussion on the foundry industry is of a dual character, because in the list of products removed from statutory control are foundry plant, conveyors, and furnaces, whilst freedom is accorded for the making of all types of machinery for food processing, brewing and the like, as well as textile machinery (except carding and card clothing plant); and paper-making plant, including printing and bookbinding machinery. In addition to the above there are included in a list of thirty-nine headings a number which involve the making of large quantities of castings. Amongst these are filtration plant; glass-making machines; steam generating plant; rubber-working machinery; mining and quarrying plant; paint-making machinery; weigh scales; electrical machinery and plant; industrial trucks and water-heating apparatus.

It is only natural that here and there clarification is needed. For example, electric machinery, which should include refrigerators, is freed, whilst refrigeration plant is still subject to licence. Moreover, there is bound to be exercised a certain amount of control through the iron and steel licensing system.

In this field, also, changes are being made, for as from January 1 there is to be no Iron and Steel Distribution Authorisation for the supplying of iron castings. For this relaxation, the ironfoundry industry is indebted to its employer organisation, the Council of Ironfoundry Associations. This action has resulted from the current ability of the ironfoundry industry to meet the load placed upon it, except for certain lines, such as heavy jobbing work. Unquestionably this will be welcomed by every ironfounder, as "M" forms, in some sections of the industry where strict control was imposed, were regarded as a real nuisance. Presumably, it will help those makers of non-cored repetition castings, who at the moment are experiencing some difficulty in keeping their mechanised plants fully occupied. Yet there seems to be imminent a real shortage of pig iron. However, the realisation will come, that it is useless boosting up the production of steel without attaching to it a commensurate tonnage of pig-iron for castings. The two are bound, in the long run, to come into line.

The developments noted above are all in the right direction and the increased freedom of action resulting from the lifting of controls will go far to recreate a spirit of enterprise, so long stifled by the multiplicity of Orders and permits.

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New President of the Equipment and Supplies Association

MR. T. A. HAMMERSLEY

At a Council meeting, following the annual general meeting of the Foundry Equipment and Supplies Association, Mr. T. A. Hammersley was elected president. Mr. Hammersley has been associated with the mechanical handling industries for 35 years. He started with the New Conveyor Company and rose to the position of chief draughtsman in charge of the estimating department. In 1928 he joined the Marco Conveyor & Engineering Company, Limited, which under his direction has been responsible for a large number of foundry mechanisations. He is an A.M.I.Mech.E. and a member of the Institute of British Foundrymen.

Latest Statistics

Labour employed in ironfoundries on September 4, 1948, was as follows:—

Process and maintenance workers, male and female, 140,509; clerical workers, male and female, 6,450. This shows a reduction of 140 on the figures published for July. The figures for the areas are shown in the table below:—

Area.	Process and maintenance workers		Clerical workers		Total workers
	Male	Female	Male	Female	
London	7,978	142	168	92	8,380
Eastern	4,933	288	146	62	5,429
Southern	1,989	62	51	21	2,123
South Western ..	3,565	158	108	33	3,859
Midlands	30,481	2,695	857	812	34,845
North Midlands ..	17,705	1,031	684	342	19,762
E. and W. Riding of Yorks	14,200	688	384	200	15,472
Scotland	19,439	830	703	475	21,447
Wales	3,358	182	114	52	3,706
North Western ..	19,588	708	521	206	21,023
Northern	8,183	422	271	123	8,999
Northern Ireland ..	1,884	—	28	2	1,914
Total	133,303	7,206	4,030	2,420	146,959

Institute of Australian Foundrymen

The September meeting of the Victorian Division was devoted to the hearing of a Paper from Mr. A. J. Murphy, M.Sc. (director and chief metallurgist of J. Stone & Company, Limited, of Deptford). It was presented by Mr. F. W. Bennett, a former colleague, now working in Melbourne.

Forthcoming Events

(Secretaries are invited to send in notices of meetings, etc., for inclusion in this column.)

NOVEMBER 15.

Institute of British Foundrymen.

Sheffield Branch :—"The Manufacture and Application of Water Turbines," by F. Williams, at the Royal Victoria Station Hotel, Sheffield, at 7.30 p.m.

NOVEMBER 16.

Sheffield Society of Engineers and Metallurgists

Joint meeting with Sheffield Local Section of the Institute of Metals. "Plastic Working of Metals," by Dr. E. Orowan, F.R.S., at the Metallurgical Club, West Street, Sheffield, at 6.15 p.m.

NOVEMBER 17.

Institute of Vitreous Enamellers.

Northern Section :—"Enamelling Steel," by W. H. F. Tickle, at the Queen's Hotel, Manchester, at 7 p.m.

Royal Statistical Society—Industrial Applications Section.

North-Eastern Group :—"Incentives and the Young Workers," by L. T. Wilkins, at the Newcastle Chemical Industries Club, 18, Lovain Place, Newcastle-upon-Tyne, at 6.30 p.m.

Institution of Production Engineers.

Birmingham Section :—"Production Practice and Research in the U.S.A., by Dr. H. Orenstein, M.I.Mech.E., at the James Watt Memorial Institute, Great Charles Street, Birmingham, at 7 p.m.

Western Section :—"Management for To-day," by A. T. Davey, in the Concert Hall, Westinghouse Brake & Signal Company, Limited, Chippenham, at 7.45 p.m.

NOVEMBER 18.

Birmingham Graduate Section :—Visit to Walter Somers, Limited, Halesowen.

Glasgow Section :—"The Organisation of Factory Maintenance and Services," by W. L. Beeby, at the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2, at 7.30 p.m.

NOVEMBER 19.

Manchester Association of Engineers

"The Leadership Quality of Management," by W. Puckey, at the Engineers' Club, 17, Albert Square, Manchester, at 6.45 p.m.

Institution of Mechanical Engineers

The Thomas Hawksley lecture on "Heat Engines," by K. Baumann, M.I.Mech.E., at 6 p.m., at Storey's Gate, St. James's Park, London, S.W.1.

Institute of Economic Engineering.

"Production Development in Southern Rhodesia," by Sir Miles Thomas, at St. Ermin's Hotel, Caxton Street, Victoria, London, S.W.1, at 7 p.m.

NOVEMBER 20.

Institute of British Foundrymen.

Bristol and West of England Branch :—"Production Problems in a Quantity Production Foundry," by J. Hird, at the Grand Hotel, Bristol, at 3 p.m.

Burnley Section :—"Some Aspects of Mechanisation in the Foundry," by J. Hill, in the Grammar School, Blackburn Road, Accrington, at 6.15 p.m.

THE MEETING of the Institution of Chemical Engineers arranged for November 16 has been postponed.

ON HIS APPOINTMENT as Superintendent of the Scottish Laboratories of the British Cast Iron Research Association, Mr. A. N. Summer is resigning from his position as chief metallurgist to Reavell & Company, Limited, Ipswich. He is also resigning from the secretaryship of the East Anglian Section of the London Branch of the Institute of British Foundrymen. Mr. L. W. Sanders, of Lake & Elliot, Limited, Braintree, has been elected to the latter position.

Plastic Flow in Cast Iron, at Room and Elevated Temperatures, with Special Reference to Relief of Stress*

By C. R. Tottle, B.Met., A.I.M.†

Synopsis

The Author considers the deformation characteristics of cast iron, especially in the relation between elastic and plastic flow, to be susceptible to considerable variations, according to the mode and speed of application of stress. The total deformation arising from any test at room temperature can be increased, and the ratio "elastic" to "plastic" decreased, merely by slow loading, or periods of ageing between successive increments of stress. The distinction between "brittle" and "ductile" materials is not so marked, therefore, when slow rates of stressing are used.

The experimental method used is that of stress free bars loaded in transverse bending, followed by study of the plastic flow taking place with time. Incremental stressing gives perfect translation of elastic into plastic deformation in remarkably short periods of time at room temperature, resulting in severely deformed cast-iron bars, normally unobtainable in routine testing. The influence of this "ageing" under stress is considered in "weathering" as a form of stress-relief treatment.

At elevated temperatures, the rates of flow and the total deformation are naturally much increased, and the application to stress relief shows that high temperatures of the order of 450 to 500 deg. C. are necessary for high-duty unalloyed iron, and 550 to 650 deg. C. in the case of alloy additions, where 70 per cent. relief and upwards is desired. Creep curves confirm the tests on relief of stress, and enable correlation of time, temperature and deformation to be made for several compositions and types of high-duty cast iron.

I—Introduction

The numerous factors involved in the mechanical testing of cast iron have rarely been considered except as aids to foundry control and specifications for castings. Several authors, Pearce,[1] Harbach,[2] Mackenzie,[3] have discussed the correlation of tests and their application by the engineer, the transverse bending test being detailed as the most useful for cast iron. Pearce, in particular, has pointed out the shortcomings of the transverse test and its particular danger in assessing "toughness." If by the latter is meant "ductility" or capacity for deformation, there appears to be little evidence available, other than total deflection at rupture in routine tests carried out in the majority of foundries.

Pearce[4] pointed out that measurement of deformation during the transverse test can be enlightening, provided that the elastic and plastic deformation be studied separately, since the two are always present in cast iron under stress, however low the stress. The ratio of elastic to plastic deformation becomes a useful guide to the ability of an iron to yield under stress without rupture, and is obviously related to the peculiar micro-structure of the material. The influence of graphite flakes, acting as notches in the internal structure, must be such as to modify the behaviour of the normal pearlite or ferrite matrix of a steel in terms of local yielding, so that elastic strain in steels becomes plastic in cast irons, the graphite itself having little or no effect beyond providing the notches and, therefore, the stress concentrations.

Plastic deformation would thus be expected from the first application of stress, since, at some points in the agglomerate, flakes would exist in the correct orientation of principal stresses to exceed the yield point of the matrix surrounding them, and plastic flow would proceed at the notches until the stress dropped below the yield point again, when only elastic strain would remain. It is true that many tests have been conducted, under different types of stressing, in which plastic flow was not detected at the first application of stress, but this is obviously a function of the measuring unit, and sensitive extensometers do show plastic flow from the commencement of stressing, however small the first load may be.

The time to conduct a test, either by bending or in tension or compression, in which stress-strain relationships are measured, can be quite short, say 15 min. under routine conditions and 1 hr. for more accurate steps and smaller increments of stress. If the time taken be purposely lengthened, with slow application of stress and time intervals between readings, the results compare unfavourably with normal routine tests, in so far as considerably greater plastic deformation is found. When such measurements of deformation are taken as indications of "toughness," it is obvious that an iron can be made to appear tough provided sufficient time elapses between the increments of stress applied.

The explanation of this phenomenon is merely a continuation of that applied to the reason for plastic flow accompanying elastic strain, since plastic flow is not instantaneous, but decreases with time in a logarithmic manner. It seems quite reasonable, as a mental picture, that a local stress concentration should lead to yielding, followed by increasing resistance of the matrix to further flow, until eventually equilibrium results and

*Presented at the London Conference of the Institute of British Foundrymen, June, 1948.

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plastic flow either ceases altogether or falls to an extremely slow rate. This mechanism of flow with time is exactly that occurring in "creep," and there are similar stages, initial rapid deformation, decreasing with time to constant rate or decreasing rate.

Under certain conditions, creep may proceed to a final stage, an increasing rate of flow leading to fracture. Obviously a complete test to destruction, at room temperature, of any cast iron, is still analagous, since as the stress increases, so does the rate of flow in unit time, until eventually fracture results. A stress-strain test on cast iron can be regarded as providing local yielding at graphite flakes, each localised yield exhibiting a rate of flow relationship similar to the early stages of creep. The test record of the test-piece as a whole affords a summation of the whole series of local yield points, and which proceeds to rupture in the manner of the final stage of creep, *i.e.*, at an increasing rate of deformation. Quantitative treatment of these defects has been made by Meyersberg.[5]

When the rate of loading is further decreased, the above effects become most pronounced, and both total deformation and proportion of plastic deformation are considerably increased, as compared with the figures obtained by rapid loading. The ultimate criterion of this slow bending method is reached by applying load in small increments, followed by periods of ageing between each increment. Then, each period of flow is allowed time to reach a state of equilibrium, or very nearly so, before any further increase of stress takes place, re-establishing the localised stress concentrations once again. Bars of high-duty iron can be bent transversely to such an extent by this method, that they resemble steel in the cold-worked condition subjected to the same test.

When temperature is raised, all these effects take place more rapidly and more completely, since the viscosity of the metal is decreased by rise in temperature, and all molecular forces retarding flow are less effective. It is for these reasons that creep takes place most markedly at high temperatures, and therefore that relief of internal stress by heat-treatment is so effective, as compared with other methods. The Author first encountered the effect of time whilst carrying out unpublished work on the stress relief of high-duty iron some four years ago, and has found this initial work most valuable in the interpretation of creep tests at elevated temperatures, on similar irons. Although the above considerations, and the experimental work, are of greatest value as applied to relief of stress, they do also illustrate the narrow division between "brittleness" and "ductility" when time is involved, and serve as a warning that time must be measured in accurate testing work, not neglected as hitherto has been the case.

II—Time-deformation Measurements with Cast-iron Bars

The original methods developed for research on internal stress and its relief, fall into two main classes: (1) the use of castings designed to produce internal stress by virtue of differential contractions in cooling, and (2) the use of stress-free bars, loaded in such a way as to enable strain measurements, before and after treatment, to be made in a simple manner. Russell[6] quoted Benson and Allison's method[7] as an accurate one, for investigation of heat-treatment on stress relief, whilst employing a casting in his own measurements. In this Paper (Russell), the results are obscured by the time interval between preparation and measurement of the test-pieces. As the Author will endeavour to show, this renders the results virtually useless, except as comparisons with each other. Russell also declares time ineffective in stress relief—due entirely to the short periods he used. The creep curves of high-duty iron are such that in raising the casting to temperature, the bulk of the initial plastic flow would be rapid, and so reduce the principal stresses that further deformation would require at least 20 hours or more, and then would require a sensitive measurement to detect it. On alloy steels and irons the Author has found time to be most effective when creep rates are low, so that stress relief measurements after one hour differ from those after five hours and 20 hours by a considerable margin. The accuracy of measurement should always be considered when drawing conclusions on any test, since negative results do not constitute proof as they stand alone, they require corroboration.

The form of test devised by Benson and Allison[7] in which two rectangular section bars are bent transversely by a stirrup, using distance pieces at the ends, is simple to use and for measuring. These Authors, in their discussion, carefully point out that the method of stress calculation, using elastic theory on beams, assumes a linear stress distribution across the section from the maximum tension to the maximum compression stresses, and that this is not necessarily true. However, by using two beams in bending, and by quoting the stress relief as a ratio before and after, the method is more accurate than using castings purposely stressed in production, since it is consistently reproduced on different bars of the same cast, and permits measurement to narrow limits, equivalent to load measurements to the nearest 50 lb. on 12-in. beams. One improvement on the method is to load up the beams on a testing machine, instead of assuming a value for the modulus of elasticity. After treatment and release from the stirrup, the testing machine can again be used to reproduce the original loaded deflection, the necessary bending load applied at this point being the residual stress. Calculation is then avoided, and the loading can be made perfectly axial and uniform for all measurements.

The above method was adopted by the present Author for the reasons given, namely, the bars were assembled in the stirrup, with the distance pieces placed in position. By means of a micrometer reading to 0.001 in., the distance apart of the bars on each side of the stirrup was measured, first with the load off, and then with the load on, the latter being applied by the compression block of the testing machine, and carefully arranged to be perfectly axial and uniform. These measurements served to give the total deflection of the two bars, and the load required to cause the deflection was known accurately.

Care was taken to average the micrometer readings across the width of the bars and between the two sides of the stirrup; at no point was the micrometer more than $\frac{5}{16}$ in. from the stirrup plate, in order to take measurements where the bending moment reached the maximum value. By means of a clock gauge fixed to the transverse table of the machine and bearing on the centre top of the compression block, a further check on the deflection at the centre of the assembly was obtained.

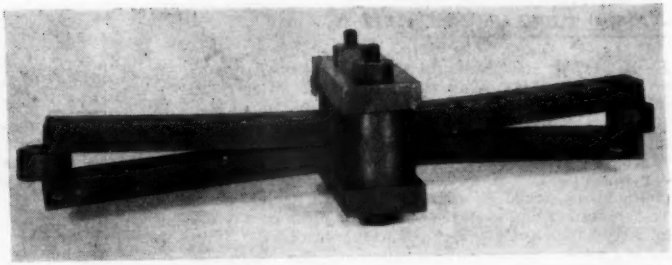

FIG. 1.—BAR ASSEMBLY AFTER REMOVAL FROM THE TESTING MACHINE AND BEFORE TREATMENT. AT A LATER STAGE CYLINDRICAL DISTANCE PIECES WERE USED IN PLACE OF THE FLAT DISCS SHOWN.

The bars were then released by removing the load, and the total deflection was again measured by micrometer and clock gauge. This reading gives the plastic flow obtained on loading, and is subtracted from the flow obtained by the various treatments applied, in order to distinguish between "permanent set" on loading and any subsequent flow which results at that particular stress level. The bars were then reloaded to give the same values as the initial loading, and then fixed in the stirrup by tightening the nuts on the retaining bolts.

The deflection was again measured by the micrometer and clock gauge to detect any changes in the arrangement. On removal of the load supplied by the machine, the bolts were holding the bars under the stress conditions imposed by the machine, and the normal treatments could then be carried out. The stretching of the bolts under stress was rendered negligible by the use of a high-tensile steel in the bolts and nuts, but remeasurement of deflection was carried out periodically throughout every test in order to detect any such change. In no case was stretching observed (see Fig. 1 for bar assembly during treatment).

After treatment, the bars were placed again in the testing machine, the load re-applied as before, and the bolts released by slackening the nuts. Checks on deflection were carried out during this operation, and then, on removal of load from the machine, the new deflections were a measure of the increased plastic flow obtained by the treatment, the bars having taken on a greater "permanent set" by the increase in the ratio of plastic to elastic deformation.

Re-imposition of the testing machine load to restore the original total deflection is then a measure of "residual stress" or "elastic stress," that is, the stress which had not converted elastic into plastic flow, as read on the balance mechanism of the machine at the original total deflection.

From these results, two methods of interpretation are possible. Either the residual stress value of the testing machine load after treatment can be plotted against a variable of the treatment, or the plastic flow obtained can be so plotted. The curves are similar, of course, but the most striking results are obtained by plotting the plastic strain expressed as the percentage of total deflection which is converted to plastic flow by the treatment. This graph shows only the increase in plastic flow obtained, since the original "permanent set" of initial loading is subtracted from the total plastic strain, and the effect of the treatment variable can then be seen to best advantage.

For these reasons, the Author has converted all the results to percentage plastic strain, thereby allowing comparison between the different treatments, and illustrating, therefore, the previous discussion on the effects of flow. Residual stress is also easily compared by this means, since 100 per cent. plastic stress means no residual stress; all the strain produced is converted into plastic flow and hence the stress has dropped to zero. In no case was zero obtained, since naturally the time required in normal treatment would be excessively long, if ever completely attained. Where different stresses have been used in measuring the flow with any particular treatment, the stress levels are quoted as the percentage of the transverse rupture stress of that particular iron, the transverse rupture stress value being obtained on bars of the same size and initial treatment as those undergoing the tests, but with normal testing speed of loading.

The bars were all cast in batches from the same ladle, being originally 14 in. long, $1\frac{1}{4}$ in. wide and $\frac{1}{2}$ in. thick.

TABLE I.—*Composition and Strength of Samples Tested.*

Sample.	T.C., per cent.	Si, per cent.	Mn, per cent.	S, per cent.	P, per cent.	Cu, per cent.	Mo, per cent.	Ni, per cent.	Tensile strength, tons per sq. in.
A	3.1	1.90	0.56	0.05	1.00	0.35	—	0.25	16.50
B	3.05	1.70	0.75	0.05	0.10	0.35	—	0.20	19.20
C	3.01	1.40	0.90	0.05	0.10	0.34	—	0.50	21.50
D	2.90	1.20	1.06	0.05	0.10	0.35	0.56	1.00	26.30

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Each was surface ground on all four faces, to give a cross-section of 1 in. by ½ in. The bars, after grinding, were then treated in vacuum by rapid heating to 700 deg. C., followed by immediate slow cooling at the rate of 50 deg. C. per hr. down to 100 deg. C., from which temperature they were air-cooled. Since each bar was uniform in section, it was assumed that this treatment produced stress-free bars, and a second check heat-treatment at 700 deg. C. failed to produce any distortion of the bars, as measured to the nearest 0.0001 in. After the heat-treatment, sections of the bars were examined under the microscope to detect any change in microstructure, and hardness tests before and after treatment were also used. In no case was any change visible or measured. Similar check, by microscope and hardness tests, was used in all subsequent tests at elevated temperatures, the results obtained with longer periods of heating being quoted under the respective tests.

III—Tests at Room Temperature

The materials tested are given in Table I.

The copper, and some of the nickel present, was inherent in the refined iron from which the bars were poured, and all the melts were inoculated with a mixture of ferro-silicon and aluminium, sufficient to make up the required silicon content. The tensile strength was determined on a separately cast bar from the batch concerned, machined from 0.750 in. diameter as cast, to 0.564 in. diameter over the gauge length.

The first treatment to which the bars were subjected was an ageing treatment at room temperature with low stress applied to each bar. The stress was then increased, and a further ageing period allowed. By this means the effect of initial stress could be obtained, and, as each set of bars was measured after various time intervals, the plastic flow which resulted could be seen by plotting percentage plastic strain against time for each stress level used. In each case, the effect of time was to reach a stable state, where the rate of plastic flow was so small as to be undetected by the methods adopted even after long periods of time. The

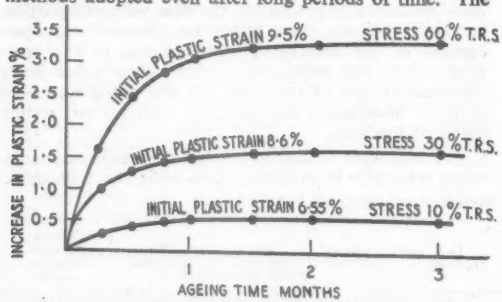

FIG. 2.—INCREASE IN PLASTIC STRAIN BY AGEING AT ROOM TEMPERATURES ON IRON D AT THREE LEVELS OF STRESS.

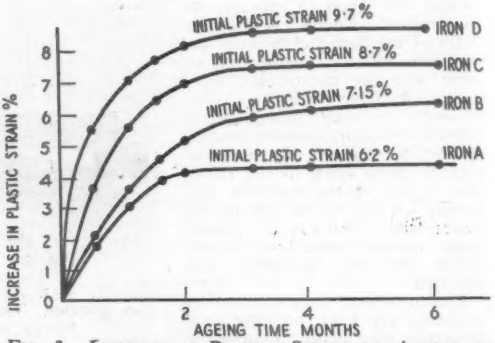

FIG. 3.—INCREASE IN PLASTIC STRAIN BY AGEING AT ROOM TEMPERATURES ON FOUR IRONS EACH LOAD INITIALLY TO 90 PER CENT. T.R.S.

rate of flow increased, at any stage, with rise in initial stress, and the time required to reach a steady state was slightly increased. When plotted as plastic strain against time, the normal form of creep curve is obvious, reaching a constant or decreasing rate of creep. Fig. 2 shows the effect of initial stress on iron D, and Fig. 3 the plastic strain at the highest stress for all four irons.

Repetition of these tests, the ageing being carried out on the roof of a building in an industrial atmosphere. was then carried out to determine the effect of atmospheric corrosion on the plastic flow. In no case was the result affected by this means, identical results being obtained with those quoted above. It is evident that the relief of stress by "weathering" is no greater than would occur by ageing inside the foundry or machine shop. Mechanical vibration has been held as an aid to stress-relief, and mechanical peening was tried on the bars whilst under stress, but with no definite results. The value of mechanical working could be more easily and adequately shown on castings themselves by the method used by Russell in his tests on machining, which proved quite effective.

IV.—Incremental Stressing

The next series of bars, using the same four irons, were stressed by increments of 10 per cent. of the transverse rupture stress, allowing an ageing period of four weeks between each increment of stress. From the curves shown in Figs. 2 and 3, it is evident that maximum flow is reached between four and eight weeks, and, therefore, each increment of stress would be expected to resolve into *almost* the maximum possible flow corresponding to each state of stress in turn. The results would then be expected to obtain the same plastic strain as was achieved for the same value of total stress applied in one loading. However, this was not the case, the gradual rise in stress value, allowing four weeks' ageing between increments, was found to increase the plastic strain far above that obtained by a single loading to a particular level, and one ageing period of six weeks.

So marked is the increase in flow attained, that the bars can be taken up to fracture in increments, and show a far greater deflection at rupture than they do in normal testing. In fact, the bars show such a curvature that it becomes difficult to realise that they are cast iron at all. The best result achieved was on iron D, which normally gave a transverse bending deflection at rupture of 0.285 in. on a 12-in. beam. When treated by the incremental method, the total deflection when one bar fractured (the other remaining intact), was 0.301 in., of which approximately 25 per cent. was total plastic strain. The amount of plastic strain obtained by normal routine testing under the same conditions was 10 per cent. of the total deflection.

FIG. 4.—BARS AFTER TREATMENT, SHOWING THE EFFECT OF PLASTIC FLOW. LEFT TO RIGHT: TWO BARS TESTED BY TRANSVERSE BENDING WITH RAPID LOADING, FOLLOWED BY FIVE PAIRS SHOWING INCREMENTAL STRESSING: AGEING PERIODS FROM 8 TO 40 WEEKS—IRON D.

Although the increase in total deflection may seem small, *i.e.*, 0.016 in., the proportion of plastic strain to elastic is also increased, and on the greater total deflection. Hence, in the iron D, the normal transverse bend test gives 0.285 in. deflection, of which 0.028 in. is plastic strain, the remainder being elastic. When tested by the incremental method, this total deflection increased, as quoted, to 0.301 in., but the total plastic strain is now 0.075 in., a considerable increase on that obtained by normal testing to rupture. Thus, the total deflection is increased by this slow incremental loading, and so is the ratio of plastic to elastic deformation which results. The actual increase in this ratio is significant, in the opinion of the Author, and much greater than experimental errors in the testing method could possibly account for, even without the careful measurements actually used. The rate of increase of the plastic strain, as shown on the curves given, is rendered even more striking on photographing the curved bars. Fig. 4 shows six bars obtained at various stress levels and after various ageing periods in incremental stressing. The bars on the left are those obtained by routine loading to fracture, showing the small plastic strain at the end of the test. The other bars, from left to right, represent five stages in the incremental stressing method, the extreme right showing the greatest curvature obtained, when one bar of a pair had just broken, having been under test for 40 weeks. The curvature is obvious, and, in the Author's opinion, most unusual for cast irons of the types tested.

When the results are plotted as plastic strain against time, they strongly resemble the creep curves, and, when carried to rupture, exhibit the complete creep curve in all its stages. Fig. 5 shows the curves so obtained. It will be seen that different irons exhibit different rates of creep and different times to reach each stage of the full curve, as one would expect from their different matrices and graphite distribution. In stressed castings where any sudden increase in stress occurs, of a temporary nature, it is likely that plastic flow will occur until that rise in stress level is dissipated, provided that sufficient time for flow to take place be allowed before the next increase in stress.

For this reason, cast iron must behave very differently from other metallic alloys, and although it is normally regarded as brittle, its performance under stress conditions where time is a function may refute the expected low shock resistance. If stress peaks are attained in rapid succession, or the value of any peak exceeds the rupture strength, it is obvious that flow cannot take place in the time available and fracture must result, but many service conditions do exist where designers cannot fully account for all possible changes in stress value or distribution, and here cast iron may perform excellently provided that time is a factor. The damping capacity of cast iron is a further aspect of this same phenomenon, and must be due to the peculiarities of a pre-notched matrix which exists in the case of this particular material.

TABLE II.—*Composition and Tensile Strength of Special Cast Irons.*

Sample.	T.C., per cent.	Si, per cent.	Mn, per cent.	Cu, per cent.	Ni, per cent.	Mo, per cent.	Cr, per cent.	Tensile strength (room temperature), tons per sq. in.
A	3.00	1.40	0.75	0.34	0.25			19.9
B	2.95	1.35	0.90	0.30	1.05	—	0.75	23.5
C	3.05	1.42	1.10	0.32	0.25	0.35	—	24.0
D	3.00	1.50	0.72	0.85	0.22	0.55	—	24.5
E	2.85	1.41	0.75	0.34	0.21	0.75	—	26.2

Plastic Flow in Cast Iron

V—Plastic Flow at Elevated Temperatures

The irons tested at elevated temperatures were chosen to include some of alloying elements which are known to affect the creep strength of steels, and which should accordingly affect the matrix plasticity in cast iron. Their compositions are given in Table II.

The bars were all treated at temperatures in the following order for 1 hr., followed by slow cooling at

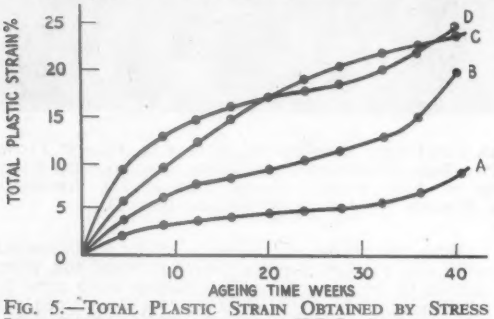

FIG. 5.—TOTAL PLASTIC STRAIN OBTAINED BY STRESS INCREMENTS OF TEN PER CENT. T.R.S. APPLIED WITH AN AGEING PERIOD OF FOUR WEEKS PER INCREMENT.

50 deg. C. per hr. to room temperature:—450 deg. C., 500 deg. C., 550 deg. C., 600 deg. C., 650 deg. C., and 700 deg. C. The results obtained are here given as plastic strain produced by the treatment at each temperature, showing the effect of composition in the case of

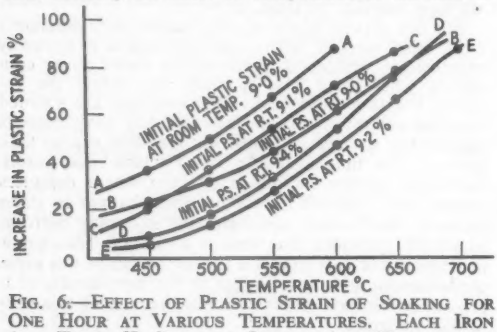

FIG. 6.—EFFECT OF PLASTIC STRAIN OF SOAKING FOR ONE HOUR AT VARIOUS TEMPERATURES. EACH IRON (SEE TABLE II) STRESSED INITIALLY TO 90 PER CENT. T.R.S.

the elements molybdenum and chromium (Fig. 6). The effect of time was then studied on those irons which showed the highest residual stresses after one hour's soaking, in order that the creep rate could be seen and its effect measured. It is obvious that creep rate does give lower residual stresses with longer times of soaking, but is not commercially sound in view of the long times required. Furthermore, those compositions with a slow rate of creep are affected by high temperatures and long soaking periods, and the microstructure shows incipient breakdown of the carbides by spheroidisation. It is unfortunate that here the maintenance of adequate strength in service opposes the full stress relief of such materials. Figs. 7 and 8 give the time test results.

VI—Creep Tests at Elevated Temperatures

Subsequent work on accurate long-time creep tests has been unfortunately carried out on slightly different

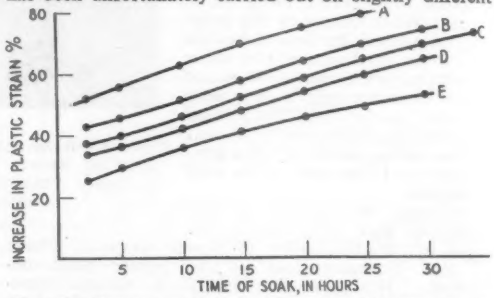

FIG. 7.—EFFECT OF TIME OF SOAK AT 500 DEG. C. ON INCREASE IN PLASTIC STRAIN—IRONS AS FIG. 6.

compositions from those given above, but the Author has found that the stress relief experiments are borne out by long-time creep tests. The rate of flow is much less in cast iron at elevated temperatures than is often supposed, and in due course the Author hopes to pub-

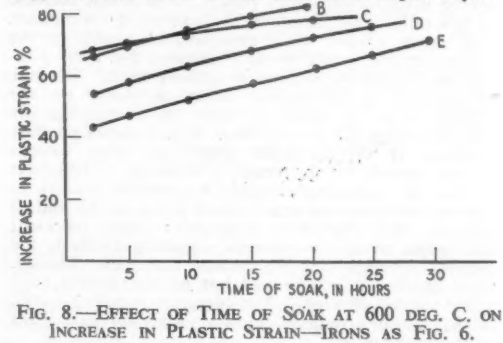

FIG. 8.—EFFECT OF TIME OF SOAK AT 600 DEG. C. ON INCREASE IN PLASTIC STRAIN—IRONS AS FIG. 6.

lish results on some heat-resisting irons containing various alloying elements.

VII—Conclusions

Consideration of plastic flow in cast irons with respect to its microstructure of graphite flakes in a matrix resembling the steels, indicates that time is a definite fac-

(*Continued on page* 463)

The British Cast Iron Research Association

Annual General Meeting

At the annual general meeting of the B.C.I.R.A., held at Grosvenor House, Park Lane, London, W.1, on Wednesday, November 3, Dr. Harold Hartley (the retiring President) presented the annual report and accounts for the year ended June 30, 1948, which, he said, made good reading. It being the last occasion on which he would present the report and accounts to the members in his capacity as President, he asked to be allowed a few minutes for his swan song before moving their adoption.

Retiring President's Address

The meeting, he said, terminated an epoch in the history of the Association. Until the middle of 1948 it had depended for financial support entirely on voluntary subscriptions from individual firms; in the 27 years of its existence those subscriptions had grown from some £2,500 to more than £29,000 per annum, and the gross income had reached nearly £53,000. In the past it had been a perpetual worry to the Director to make sure that the financial support the Association received would enable him to carry out the programme of work which the Council and the Research Committees had envisaged as necessary. One felt sure that all who had subscribed voluntarily to the Association must welcome the arrangements which had been concluded with the Joint Iron Council, by which the required finance would be provided by means of a levy on pig-iron. Every ironfoundry in the country was now eligible for membership, which they could obtain by a simple formality. In the future, the collecting of that financial support was to be done by the Joint Iron Council. Next year the Association should have a minimum income of £65,000; but it was hoped that some of its friends would continue further to help by voluntary subscriptions, so that the target of £100,000, referred to in his address some three years ago, might be reached, with the further help of the D.S.I.R. grant.

In the summer of 1932 he had joined the Council of the Association, and during the 16 years that had passed he had had considerable experience of the working of the organisation, first as chairman of the Research Committee, and then, during the nine years, 1937-45 inclusive, as Chairman of Council. In December, 1945, the members did him the honour of appointing him President. The nine years during which he was Chairman of Council were marked by considerable development in the Association. During that period the gross income had increased from £16,000 to £42,000 per annum. The Association had acquired the new headquarters at Bordesley Hall and had laid the foundations for considerable development. Eight years ago, when contemplating the purchase of Bordesley Hall, they had had to borrow £10,000; and it would be remembered how much they owed in those years to their late friend, Mr. Percy Pritchard.

The considerable development which was taking place could not have occurred had there not been on the Council men willing to devote an appreciable amount of their time and energy to the affairs of the Association. During the war years the Council had agreed to the formation of the Executive Committee; and Dr. Hartley again acknowledged how much the Association owed to those who had served as members of that Executive Committee during those trying years. Each of them might justifiably take pride in the success of their efforts; and they would agree that, if the Association had not had an energetic Director, who had collected a really first-class staff, it would not to-day have its well-deserved reputation. It was fortunate that such care had been taken to ensure that the activities of the Association were nicely balanced in regard to the pursuit of fundamental knowledge and its technical application and development, whilst there was at the same time full appreciation of the need to give service to members, either by correspondence or in their own works as and when required. With the considerable increase of membership which was now taking place, that section of the Association's activities must increase considerably.

Structure of the Association Re-examined

It had been the Director's desire, at this juncture especially, to have the whole structure of the Association examined critically, to ensure that the wishes of the Council and the Committees should be dealt with satisfactorily. The constitution of the Council had been completely revised, and the organisation of the Association had been considered very carefully by the Executive Committee. Nevertheless, the Director would value any suggestions which members could make about policy, the programmes and the internal organisation.

Acknowledging the pleasure and benefit he had derived from his connection with the work, the President said he would cease direct participation in the Association's activities with real regret. He could not undertake to continue to attend Council meetings; but he believed, on principle, that past-presidents should not continue to function on the Councils of such bodies. The President also paid tribute to Mr. Percy Wilson, who took over chairmanship of the Council at the end of 1945; in the intervening years the work of the Association had developed probably more rapidly than ever before.

Recalling that Samuel Johnson—whose memory Dr. Hurst spent some time in keeping green—had once observed that a man never did anything for the last time without regret, the President said his own regret at the end of his term of office was tempered by appreciation of a suggestion made, he believed, by Mr. Arnold Pearce, that means should be devised to keep together those who had held honorary office in the Association. He understood the proposal had been warmly received, and he hoped something would mature; and he suggested to the Director that he might keep green the memory of past-presidents by publishing their names in the Bulletin.

(It was later stated by the new President Mr. P. H. Wilson that the suggestion was noted and would be adopted.)

B.C.I.R.A Annual Meeting

Finally, Dr. Hartley wished the Association even greater success in the future than it had had in the past; and that its reputation and that of its Director and staff might continue to increase.

On the motion of Dr. Hartley, seconded by Mr. P. H. Wilson, the report and accounts were adopted, there being no comments or questions.

The New President

Proposing the election of Mr. P. H. Wilson as President, Dr. Hartley paid further tribute to his work on the Council and on the Executive Committee. His active interest in the affairs of the Association was amply demonstrated when he had accepted chairmanship of the Council at the end of 1945; and it was a very happy circumstance that the Association should honour a retiring chairman by electing him president. In their particular case they had the opportunity to elect one who knew the industry well, who had been concerned very closely with its affairs and who would add lustre to the office of President.

MR. J. J. SHEEHAN, who seconded, paid tribute to Mr. Wilson's geniality in office and out of it, his experience in the industry and in the business of chairmanship, and his competence.

MR. WILSON, who was unanimously elected, was formally inducted into the chair, Dr. Hartley expressing good wishes for his happiness and success in office.

Assuring the members that he was fully conscious of the great honour conferred upon him, he said that under the new constitution the Association would be able to increase its activities considerably in the future. For some years it had had visions of fields of research which were beyond its reach, in view of its restricted income. Under the new constitution every ironfounder in the country was entitled to become a member and benefit thereby simply by signing a form; and by the reconstitution of the Committee and Council it was felt that the whole industry would be fully represented. His only request to those who were appointed was that they would attend the Council meetings regularly and take a keen interest in carrying out the programme for the future. It would be the Association's earnest desire to serve the industry as a whole.

Thanks to the Retiring President

MR. S. H. RUSSELL, proposing a resolution of thanks to Dr. Hartley for his services to the Association, recalled that he had served on the Council for 16 years, and had been chairman of the Council for perhaps the most critical nine years of the Association's history; it was certainly the period in which the Association had made most progress. Mr. Russell recalled the meeting at which Dr. Hartley had presented to the Council the scheme for acquiring Bordesley Hall, Alvechurch. The decision was a very big one to make and it had to be made by a very small number of people. Birmingham was during that period of the war a hot spot, and the Association had some very delicate apparatus. One was always very much impressed by Dr. Hartley's anxiety always to explain the why and the wherefore of every suggestion that came from the more or less newly-appointed Executive Committee. It would be realised now what a very wise decision it was to move to Bordesley Hall. That must be a great source of finances were on a very sound footing and the Association could now go forward from strength to strength. pleasure to Dr. Hartley, and also the fact that the It had always been a very great pleasure to serve under him in any capacity whatever. Mr. Russell coupled with the resolution the election of Dr. Hartley as an honorary member.

DR. J. E. HURST seconded. As one who had served for a number of years on the Research Committee, had succeeded Dr. Hartley as chairman of that Committee and had served throughout the war years on the Executive Committee, he emphasised particularly Dr. Hartley's drive and the inspiration which the Association had derived from his activities. One also valued his friendship very highly.

The resolution having been carried with enthusiasm, DR. HARTLEY expressed his pride in having been concerned with the work of the Association, to which he had often referred as one of the bright blue-eyed boys of the D.S.I.R. group. That had been brought home to him on the occasions when the Association had asked the Grants Committee for more money; it was true that the Technical Director had prepared the ground very well beforehand, but it had always been very gratifying to be received so cordially.

Vice-Presidents

Four Vice-Presidents were elected—Mr. P. A. Abernethy, Sir William Griffiths, Dr. J. E. Hurst and Mr. F. Scopes (President of the Joint Iron Council). The warmest thanks of the Association were accorded the retiring Vice-Presidents—Mr. V. W. Bone, Mr. E. Player, Mr. R. J. Rogers and Mr. J. Shaw.

Election of Council

The position arising under the new constitution concerning the election of Council was explained by the Director, Mr. J. G. Pearce. All existing members of the Council had tendered their resignations, and the Executive Committee had recommended that, in order to avoid complications in the future with respect to retirement and re-election (the Articles of Association provided that one-third of the Council should retire each year), the resignations be accepted and the whole Council be elected anew.

In the first place, there were twelve nominations by the Joint Iron Council in accordance with the mutual arrangements made. Of that number, seven were new to the Council and five were already members of it. The Executive Committee recommended that the whole twelve be elected.

The seven who were new to the Council were:—Mr. D. K. Barclay, Mr. W. J. Colton, Mr. C. Gresty, Mr. R. L. Handley, Mr. R. S. M. Jeffrey, Mr. G. R. Shotton, and Mr. R. K. Nicholson.

The five nominees who were already members were: Mr. N. R. Rees, Mr. S. H. Russell, Mr. J. J. Sheehan, Mr. G. H. Johnson, and Mr. G. T. Lunt.

The following were newly elected to the Council: Mr. K. Marshall, Mr. A. E. Peace, Mr. R. C. Shepherd, and Mr. Leslie F. Wright.

In addition, the following names were put forward of representatives already serving on the Council:—Mr. C. C. Booth, Mr. V. Everard, Mr. H. Field, Mr. T. Makemson, Mr. A. E. Pearce, Mr. FitzHerbert Wright, and Mr. T. M. Herbert.

The affiliations of the gentlemen named were indicated by the Director; and, on the motion of Dr. J. E. Hurst, seconded by Mr. E. Hunter, they were elected to the Council.

Retiring Members of Council

Thanks to the retiring members of Council for their part in the Association's activities were expressed by the President, and seconded by Dr. Hurst. Those members were:—Dr. S. F. Barclay, Mr. V. C. Faulkner, Professor D. Hanson, D.Sc., Dr. L. Northcott, Mr. A. J. Richman, Mr. W. Thomas, and Professor T. Turner.

DR. HURST made special reference to Professor Turner, from whom the Director had received a letter intimating that he would no longer be able to attend the annual meetings. Dr. Hurst said he did not know the Professor's age, but the date of his Paper on the influence of silicon in iron was about 1885-88; it was remarkable that a man who had produced so long ago a Paper which was the beginning of the modern metallurgy of cast iron should be still with us, and had maintained continued interest in the activities of the Association since it was formed. Dr. Hurst asked that a message be sent to Professor Turner, expressing appreciation of his continued interest and hoping that he would still maintain that interest. (It was agreed that that should be done.)

Council and Committees, the Chairman, the Director and Staff

Votes of thanks were accorded the Council, Committees and Sub-Committees, the President for his conduct of the meeting, and the Director and staff for their work during the past year. In proposing the last vote of thanks, the President said the Director and staff had had a very full programme during the past year and they were in for an even more active time during the coming year. The Association had the greatest confidence in them; the members were satisfied with the way in which the affairs of the Association were conducted, and looked forward with confidence to the future. They were out to reach an income target of £100,000, if not in the current year, then certainly in the next year. That might appear to be a large sum, but in his opinion it was far too small. Bearing in mind that the Association represented the great ironfounding industry, employing about 150,000 people, and having a turnover of something over 3,000,000 tons, the turnover in money must represent between £100 million and £150 million. Thus, £100,000 was only one-tenth of 1 per sent. of the turnover of the industry. In other progressive countries 1 per cent. of the turnover of an industry was considered a reasonable amount to spend on research.

The DIRECTOR (Mr. J. G. Pearce), responding on behalf of himself and his colleagues, said they realised the momentous nature of the change which was coming over the Association and would endeavour to meet all that was required of them in the most complete way and with the fullest regard to the interests of the industry as a whole.

Plastic Flow in Cast Iron

(*Continued from page* 460.)

tor in the rate of flow and the total deformation obtained under stress. Slow rates of loading in the transverse bend test produce much greater deformation than normal routine testing indicates.

The maximum effect was achieved in the present tests by incremental stressing, allowing sufficient ageing period between stress increments to reduce the flow to a very small rate. By this means the amount of plastic deformation can be more than doubled on certain compositions of iron.

At elevated temperatures, the flow is increased in rate and quantity, the increases varying with composition and time of soaking at temperature. The elements molybdenum and chromium show pronounced effects on slowing the creep rate at elevated temperatures, and time is much less significant in the case of irons containing them.

With regard to the application of time, temperature and deformation on the relief of internal stress, the Author has not considered the necessity or otherwise of such relief, but merely indicated the slow creep rate which results at low temperatures, and the necessity for temperatures of the order of 450 to 550 deg. C. in plain high-duty iron, and 550 to 650 deg. C. in the case of alloyed iron. The effect on the microstructure is pronounced at temperatures exceeding 650 deg. C., and for some alloyed irons, particularly those containing molybdenum, this temperature therefore represents a probable maximum for stress relief. The temperatures given are those to secure relief of the order of 65 to 70 per cent., taken to be a figure within the range required in most cases where distortion in service is to be avoided, and also representing the maximum permissible temperature where breakdown of the structure is to be avoided.

Acknowledgment

The Author wishes to acknowledge the assistance and guidance of Professor C. E. Pearson, Professor of Metallurgy, King's College, in the preparation of this Paper.

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6 Russell, P. A. "Heat-Treatment of Grey Cast Iron for Relief of Internal Stress." Proceedings I.B.F. 1945/46, Vol. XXXIX pp. A185.

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MR. WILLIAM STOTT, who has been on the staff of Smith & Wellstood, Limited, Bonnybridge, for 34 years, and, since 1945, manager of the Glasgow showrooms, has been appointed to the Board of Directors.

Institute Elects New Members

At the meeting of the Council of the Institute of British Foundrymen, held at the Royal Station Hotel, York, on October 16, the following were elected to the various grades of membership:—

FIRST LIST

As Subscribing Firm Members

Allied Ironfoundries (Ireland), Limited, Waterford, Eire (representative, A. H. Masser); James & Ronald Ritchie, Limited, Acklam Foundry, Middlesbrough (representative, James Stell).

As Members

C. Batchelor, foundry manager, James Barwell, Germiston, South Africa; G. D. Cochrane, managing director, J. & R. Ritchie, Limited; R. Connell, foundry manager, J. Howden & Company, Limited, Glasgow; W. Cooper, foundry manager, Shaw Foundry Company, Willenhall; *R. G. Duckett, assistant technical manager, Foundry Services, Limited, Birmingham; R. F. Fisher, foundry engineer, Bonney Floyd Company, Columbus, Ohio; E. Fox, foundry manager, Humber, Limited; E. Hadley, foundry manager, C. Henshaw & Sons, Limited, Edinburgh; P. Hewins, director, H. Hewins, Limited, Stroud, Glos; T. Lewander, sales director, Hugo Montgomery A.B., Stockholm, Sweden; A. T. Mason, foundry foreman, John Harper & Company, Limited, Willenhall; J. R. Richardson, R. J. Richardson & Sons, Limited, Birmingham; *R. D. B. Robinson, director, Stourbridge Engineers & Ironfounders, Limited.

As Associate Members

J. H. Andrew, assistant to chief metallurgist, Glenfield & Kennedy, Limited, Kilmarnock; T. E. Beech, foundry foreman, Dialoy, Limited, Cardiff; B. Bendelow, foundry manager, R. Hyde & Son, Limited, Chesterfield; J. A. Brown, foundry executive, Paul & McLachlan, Limited, Denny; J. A. Carson, technical representative, Cockatoo Docks & Engineering Company, Pty., Limited, London; A. R. Cluett, metallurgist, African Malleable Foundries, Limited, Johannesburg; R. W. Cuthill, head foundry foreman, D. Fraser & Sons, Arbroath; M. C. Davis, foundry foreman, Newman Hender & Company, Limited, Woodchester; W. R. Drake, patternshop foreman, Newman Hender & Company, Limited, Woodchester; A. K. Dutt, foundry superintendent, Bharti Electric Steel Company, Limited, Howrah, India; T. W. Farey, foundry foreman, C. Carr, Limited, Smethwick; C. B. Fearnside, teacher, School of Engineering, Burnbank, Glasgow; H. Fisher, foundry manager, trainee section, General Electric Company, Limited; D. Glen. moulder, North British Locomotive Company, Limited, Glasgow; G. S. Hawthorne, foundry superintendent, Brockhouse Castings, Limited, Wednesfield; R. A. Harris, foreman engineer, Cockatoo Docks & Engineering Company, Pty., Limited, Australia; B. Henry, assistant foreman, Angus Engineering Works, Bengal; G. A. Howells, shop foreman, Dialoy, Limited, Cardiff; D. McKay, sales representative, T. S. Smeeth, Bradford; W. Moir, foundry foreman, Consolidated Pneumatic Tool Company, Fraserburgh; *W. R. Lumley, officer, Technical School, Anglo-Iranian Oil Company, Limited, Abadan, Iran; A. L. Murray, foreman patternmaker, Donkin & Company, Limited, Newcastle; W. S. Paulin, director, Donkin & Company, Limited, Newcastle; C. R. Porter, brassfoundry foreman, Newman Hender & Company, Limited, Woodchester; R. T. Sealby, technical and sales engineer, Stewarts and Lloyds, Limited; A. Shillam, foundry technician, Keighley Laboratories, Limited; J. Sneddon, foreman patternmaker, Central Engineering Works, Johannesburg; W. V. Terrill, partner, Terrill Bros., Hayle, Cornwall; J. Thom, foundry foreman, Donkin & Company, Limited, Newcastle; B. G. Wallwork, foundry technical student, Keighley Laboratories, Limited; H. Webb, foundry foreman, T. Perry, Limited, Bilston; W. R. Winter, foundry manager, Darlington Railway Plant & Foundry Company, Limited; N. F. Wright, secretary and director, Coneygre Foundry, Limited, Tipton.

As Associates (over 21)

W. Dyer, foreman coremaker, Paul & McLachlan, Limited, Denny; D. Herd, leading hand, Paul & McLachlan, Limited, Denny; S. S. Karnad, foundry executive, Garlick & Company, Stockton; J. Massey, moulder, Heaton Foundry, Limited, Gateshead; R. Paterson, assistant foreman, Paul & McLachlan, Limited, Denny; C. H. Samson, laboratory assistant, W. Shaw & Company, Limited, Middlesbrough.

As Associates (under 21)

B. Armstrong, apprentice metallurgical chemist, N.E. Marine Engineering Company, Wallsend; E. Caygill, apprentice patternmaker, Consett Iron Company, Limited; S. E. Crook, patternshop apprentice, Holcroft & Son, Wolverhampton; K. Fisher, apprentice patternmaker, Dorman, Long & Company, Limited, Middlesbrough; J. A. Harrop, scientific managerial cadet, N.E. Engineering Bureau, Newcastle; P. G. Jenkins, scientific managerial cadet, N.E. Engineering Bureau, Newcastle; B. D. Kirby, apprentice moulder, W. Shaw & Company, Limited, Middlesbrough.

(*To be continued*)

* Transferred.

Foundry Training Films

It is pleasing to announce that the Council of Ironfoundry Associations has now received from America a series of training films covering practical aspects of bench, floor and machine moulding. These 16-mm. films, which are accompanied by film strips serving as "quizzes," require from 10 to 25 min. showing time. We have seen quite a number of these and, whilst they differ from British practice in some details, we deem them to be excellent. Member firms desiring to book dates for display in their own works, or society secretaries for showing at their meetings, should make early application to the C.F.A. at Derbyshire House, Belgrove Street, London, W.C.1.

THE ASSOCIATION OF BRONZE AND BRASS FOUNDERS announces that an informal meeting of members in the London area will be held at the Clarendon Resaurant, Hammersmith, on Thursday, November 25, commencing with luncheon at 1.15 p.m.

Insurance in Connection with Exports

By F. J. Tebbutt

With most firms nowadays interested in exports, this article is presented as showing the position up to date, as regards the guarantees against loss provided by the Export Guarantees Act, 1945 (and older Acts). Apart from the guarantees (really an insurance against loss for which the Board of Trade has power to use up to £200 millions and £300 millions by the 1948 Act) the scheme provides for information to be available to firms through the Export Credits Guarantees Department, as regard firms in and of foreign countries, covering the type of trade done and business possibilities generally.

The policy mostly used—a comprehensive one—is called the Contracts Policy and, by this, losses which may occur in certain circumstances as given in the following paragraph are covered. Thus, losses owing to the insolvency (or protracted default in payment) of the buyers are covered; exchange restrictions or a shortage of exchange in the buyer's country which may prevent the transfer of sterling to the U.K.; the risk of payment being prevented by war; or by civil commotion, war, or other disturbance in the buyer's country; the cancellation or non-renewal of an export licence or the imposition of restrictions on the export of goods not previously subject to licence; of additional handling, transport, or insurance charges by an interruption or diversion of voyage outside the U.K., which it is impracticable to recover from the buyer; and, generally speaking, cover is given against loss through any cause outside the control of exporter, or buyer, from events occurring outside the United Kingdom.

Payments Allowable

For insolvency (or protracted default in payment) payment up to 85 per cent. of the contract price is made, for all other risks 90 per cent. Moreover, there may be other monies which may be recovered later (*e.g.*, from buyer's estate), 15 per cent. of which goes to the exporter, 85 per cent. to the Export Credits Guarantee Department, if the case concerns insolvency (or protracted default), 10 per cent. and 90 per cent. respectively, in other cases the percentage is based on the risks covered by the respective parties. The policy can cover all the exporter's overseas trade or insurance can be just for certain markets. Thus an exporter can omit markets for the trading risks of which he is prepared to accept himself, provided the rest of the business offered is reasonable and not just a single transaction on one market with one shipment. In these cases the premium would be at a higher rate than where the exporter is insuring the whole of his export business. If an exporter does not wish to include any risk of loss prior to shipment, there is another policy available, the "Shipments Contract," under which only shipments are declared; this insurance is at a lower rate than under the Contracts Policy of full cover.

Premiums naturally vary according to the particular country of export and the risks involved and can be as low as 5s. and as high as 40s. per £100 of turnover, but where the turnover is of respectable proportions the premiums on average may not exceed £1 per £100 of turnover.

Special Items

This "guarantees" procedure not only applies to goods, but the execution of works or services outside the United Kingdom come within the scheme, including the provision of labour or materials, so the cost of the installation of machinery or plant, erection of buildings, etc., could be covered; included also could be fees of experts and consulting engineers, the cost of training employees abroad, all these matters coming within the requirement of the scheme because they are matters to establish or encourage export trade. For capital goods, machinery, plant equipment, etc., mostly special contracts would rule to meet the individual requirements of the exporter, but, even so, these are based on the general "Contracts Policy."

Sales by merchants and sales from stocks abroad can be covered by a guarantee. Sales of raw materials and primary products produced abroad and shipped from one foreign country to another without coming here (or by *entrepot* trading, as example through the *entrepot* port of London) can also be covered by U.K. merchants.

Publication Received

A Mechanised Foundry Plant for the Production of Cast-iron Components for Domestic Gas Cookers. Published by the Marco Conveyor & Engineering Company, Limited, Rowin Works, Lynn Road, Leytonstone, London, E.11.

In this well-illustrated brochure an excellent description is given of the mechanised moulding plant installed in the works of the Richmond Gas Stove Company, Limited—one of the Radiation Group. Moreover, a glimpse is given of the type of co-operation a foundry manager should give in the initial stages to the foundry engineers. In this case, at the drawing-board stage, it was decided that the plant should make sufficient castings to manufacture a thousand cookers per week. To do this, a dozen B.I.C. magnetic squeezers would give the necessary output, using three standardised sizes of moulding boxes all 7 in. deep when assembled in pairs. As a high percentage of the castings have to be vitreous enamelled, it was decided to have available two types of sand. It was calculated that 60 tons per hour of backing, and five tons of facing would be adequate. From the establishment of the minimum cooling time between pouring and knocking-out, the speed and length of the mould conveyor could be established. This done, the story is unfolded of the details. A good feature is the installation of one extra conveyor to feed into a hopper installed outside the building to store excess sand ready for its final removal by lorry. This brochure is available to our readers on writing to Leytonstone.

Parliamentary

Industrial Subsidies for 1948-49

MR. GLENVIL HALL, Financial Secretary to the Treasury, in a written answer to MR. DAGGAR, gave details of the subsidies given to various industries for 1946-47 and 1947-48, and also the amounts voted for 1948-49. The reply stated that the list showed the amounts included in the 1948-49 estimates, but excluded any discontinued since the estimates were approved. The list did not include losses on trading by Government departments (such as the trading loss on iron and steel due to sale at controlled prices of high-cost imported steel and steel scrap and to changes in the level of stocks); nor did it include expenditure provided under general policies such as housing, social services, the training, resettlement and transference of labour, distribution of industry, cost of living or research. The following table gives details of certain of the industries referred to in the reply.

	Actuals, 1946-47.	Actuals, 1947-48.	Voted, 1948-49.
	£	£	£
Iron and steel	7,673,500	7,938,000	3,250,000
Ferro-chrome	75,000	64,890	100,000
Magnesium	335,790	107,000	Nil
Aluminium	953,100	Nil	Nil
Coal stocking	346,106	154,791	380,000
Fuel oils and kerosene ..	622,695	1,227,204	25,000
Canals and canal carriers ..	788,470	1,411,190	300,000
Coastal shipping	476,565	636,868	676,600

[Mr. G. R. Strauss, Minister of Supply, stated in the House of Commons last September that payments amounting to about £11,500,000 were made in respect of iron and steel in 1947-48, made up of:—(*a*) Difference between pre-war cost of freight on foreign ore plus 50 per cent. and cost of such freight at present; (*b*) difference between cost (including freight charges and import duty) of imported steel and controlled price in the U.K.; (*c*) uneconomical production of home ore; (*d*) difference between the cost of imported scrap (including freight) and the controlled prices in the U.K. Payments in the case of (*a*) and (*b*), he said, were made to the British Iron & Steel Corporation, which handled the transactions as agents of the Ministry of Supply. Payments under (*c*) were made to the firms mining the ore. Transactions under (*d*) appeared in the accounts of Iron & Steel Disposals, Limited, a Government-owned company.]

WHILE ANNOUNCING very encouraging trading results for the year ended June 30, Mr. Henry Blackburn, chairman of Thomas Blackburn & Sons, Limited, structural and general engineers, ironfounders, etc., of Preston, points out that the export trade which has served the company so well during the year may not, under present troubled international conditions, continue at the present high level. "Moreover, legislation may be introduced in the near future which may disturb the whole basis of our prime material supply and upset good will and trading relationships which have been built up over three generations." Mr. Blackburn says that no less than 70 per cent. of the products of one of the departments has been sent overseas.

Ministry of Supply Auction Sales

The following are among forthcoming auction sales announced by the Ministry of Supply. Names and addresses of the auctioneers are given in parentheses; catalogues (6d. each) may be had on application to them.

NOVEMBER 16-17, at M.O.S. Depot 98, Tower Bridge Road, London, S.E.1—Electrical equipment, hand tools, spotwelders, etc. (Fuller, Horsey, Son & Cassell, 10, Billiter Square, London, E.C.2.)

NOVEMBER 16-19, at M.O.S. Storage Depot, Rotherwas, Hereford—Generating sets, electric motor and switch equipment, etc. (Russell, Baldwin & Bright, 20, King Street, Hereford.)

NOVEMBER 17-19, at M.O.S. Depot 119, Knottingley, Yorks—Electrical, engineering and general miscellaneous stores. (Bentley & Son, Knottingley.)

NOVEMBER 25-26, at R.A.F. Maintenance Unit No. 216, Sutton Coldfield, near Birmingham—Miscellaneous engineering stores, chemical laboratory (educational) equipment, etc. (A. W. Smallwood, Floyd & Jones, 23, Colmore Row, Birmingham, 3.)

NOVEMBER 25-26, at M.O.S. Depot 73, Gatend Farm, Giffen, Ayrshire—Electrical, engineering equipment, etc. (Hugh McIlwraith & Son, 269, Buchanan Street, Glasgow, C.1.)

Mond Nickel Fellowships

The Mond Nickel Fellowships Committee awards each year a number of travelling fellowships for a course of training, normally in industrial establishments, in the United Kingdom or overseas. A sum of £50,000 was set aside by the Mond Nickel Company, Limited, in 1946 for this purpose. Three awards are announced for 1948. They go to:—MR. S. G. CAMPBELL (Plessey Company, Limited) to study the various stages of the organisation, from research to large-scale production, of specialised metallurgical industries in the United States and Canada; MR. S. J. GARVIN (Murex, Limited) to study the application of sponsored research, and the administrative methods employed, in the powder metallurgical industries in the United States, and MR. A. I. NUSSBAUM (Thos. Firth & John Brown, Limited) to study the application of rolling-mill research, mill plant development and the theory of rolling to the manufacture of rolled-steel products.

Applications for awards for 1949 will be invited at a later date. Full particulars regarding the fellowships can be obtained from the Secretary, Mond Nickel Fellowships Committee, 4, Grosvenor Gardens, London, S.W.1.

SPEAKING AT THE launch of the 9,000-ton motorship, Autilochus, by Harland & Wolff, Limited, Belfast, on November 2, Sir Frederick Rebbeck, chairman and managing director of the company, gave a warning of the possibility of a slackening of activity overtaking the shipbuilding industry. He declared that everyone must pull their weight from now on if they were not going to suffer from the gradual elimination of the sellers' market.

News in Brief

THE LONDON OFFICE of Aveling-Barford, Limited, will, from November 15, be at Morris House, 1-5, Jermyn Street, W.1.

THE CAPITAL ISSUES COMMITTEE has approved the issue by the British Aluminium Company, Limited, of £1,500,000 3 per cent. mortgage debenture stock.

MIDLAND ELECTRIC MANUFACTURING COMPANY, LIMITED, Birmingham, has announced a 5 per cent. reduction in the prices of all its products. The reduction is effective from November 1.

THE AUSTIN MOTOR COMPANY, LIMITED, has decided to complete the purchase of a site of about 110 acres at Blackheath, 16 miles from Capetown, on which to construct a plant for assembling its cars.

A 120-FT. CHIMNEY in the works area of Pegson, Limited, iron and non-ferrous founders, of Coalville, Leics, and which over 100 years ago served a now defunct colliery, was felled on October 30 because it was considered unsafe.

PEEBLES & COMPANY, LIMITED, manufacturers of gas regulators, of Edinburgh, has been granted a warrant for the erection of a machine-fitting and testing shop at Tay Works, Bowling Green Street, Leith. The cost of the erection will be £9,000.

SILENTBLOC, LIMITED, and its subsidiary company, Andre Rubber Company, Limited, have recently opened Northern headquarters at 11, Cloth Hall Street, Huddersfield (telephone: Huddersfield 5491), under the management of Mr. H. Clements.

THE VISCO ENGINEERING COMPANY, LIMITED, Croydon, has received an order for dust-collecting equipment for the cement industry. The contract includes 10 "Visco-Beth" automatic dust-recovery plants, complete with all ancillary equipment.

STAVELEY COAL & IRON COMPANY, LIMITED, had 94 indentured apprentices and 226 employees attending Chesterfield Technical College, stated Mr. T. A. McKenna, managing director, recently. Of these, 127 were allowed time from work (with pay) to attend the courses.

AT A MEETING on November 25, shareholders of Henry Norrington & Son, Limited, agricultural implement makers and ironfounders, of Exeter and Axminster, will consider a proposal to increase the capital of the company to £100,000 by the creation of £40,000 of new ordinary shares.

THE RAILWAY EXECUTIVE has placed a contract with John Brown & Company, Limited, Clydebank, for the construction of a ship for the Harwich-Hook-of-Holland service, to replace the s.s. Prague which became a total loss as the result of a fire while undergoing repairs early this year.

METAL INDUSTRIES, LIMITED, has taken a substantial financial interest in John Allan & Company (Glenpark), Limited, non-ferrous alloy manufacturers, of Glasgow. No alteration is contemplated in the character of the business, and the management will continue under the direction of Mr. John R. Twaddle, managing director.

RESOLUTIONS have been passed by the States of both Guernsey and Jersey agreeing in principle to a proposal put forward by H.M. Government that, for distributive purposes, the Channel Islands should in future be wholly treated as part of the home market rather than as an "export market" for United Kingdom goods.

SPEAKING AT THE launch of the 2,400-ton cable ship, Edward Wilshaw, Mr. P. Denham Christie, managing director of Swan, Hunter & Wigham Richardson, Limited, the builders, said that the company had built 21 cable ships, a highly specialised form of shipbuilding, in the course of 46 years. He claimed that this was a world record.

SO THAT THE company's tubemakers may learn of the final uses to which their workmanship is put, the Talbot-Stead Tube Company, Limited, Walsall, a subsidiary of Tube Investments, Limited, borrowed finished products from its chief customers and held an exhibition at the works, employees, their families and their friends being invited.

THE BUSINESS of an extra-ordinary general meeting of Robey & Company, Limited, engineers and boilermakers, etc., of Lincoln, called for November 19, includes an increase in the directors' borrowing powers from £200,000 to £300,000. Amendments to the articles cover the exemption of the directors from the age limit imposed by the new Companies Act.

MR. F. SHEPHERD, operational superintendent and special director of Dorman, Long & Company, Limited, spoke of the wide opportunities for promotion which are offered by the steel industry in the course of his presidential address to the Cleveland Institution of Engineers. "Young men already in the iron and steel industry," he said, "and those contemplating entry have a real and unique opportunity of attaining leading positions." Managerial and administrative posts, he continued, were not the preserve of any one branch, but were open to all. Almost without exception the leading positions in the industry were held by men trained by the companies concerned. They needed a steady flow of keen young men to whom were offered many and varied openings.

THE WEARSIDE DISTRICT ADVISORY COMMITTEE of the North Regional Board for Industry, which has been set up to co-ordinate electricity load-spreading in the area, will have as its chairman Mr. W. H. Purdie, engineering director of William Doxford & Sons, Limited, Sunderland. Employers' representatives on the committee include Col. T. G. Greenwell, managing director of T. W. Greenwell & Company, Limited, Mr. N. C. Marr, a director of the Sunderland Forge & Engineering Company, Limited, and Mr. J. E. Steel, a director of Steel & Company, Limited, electrical and mechanical engineers, of Sunderland. Trade union representatives include local officials of the Confederation of Shipbuilding and Engineering Unions, Boilermakers' Society and Ship Constructors' and Shipwrights' Association.

Company News

(Figures for previous year in brackets.)

Meters—Interim dividend of 4% (same).

Singer Motors—Dividend of 5% (same).

Barton & Sons—Interim dividend of 3% (same).

William Dixon—Interim dividend of 2½% (same).

F. Francis & Sons—Interim dividend of 5% (same).

Geo. Adlam & Sons—Interim dividend of 12½% (same).

Morris Motors—Interim dividend of 10%, tax free (same).

F. H. Lloyd & Company—Interim dividend of 3% (same).

Spurling Motor Bodies—Interim dividend of 12½% (same).

Horseley Bridge & Thomas Piggott—Dividend of 15% (same).

Barrow Hematite Steel Company—Interim dividend of 5% (same).

Walter Spencer & Company—Final dividend of 10%, making 15% (same).

North Broken Hill—Dividend of 2s. 6d., Australian currency (3s. and bonus of 2s.).

Broken Hill South—Dividend of 4s., Australian currency (2s. 6d. and bonus of 2s.).

Betts & Company—Final dividend of 10% (7½% and bonus of 5%), making 15% (same).

Richard Hill & Company—Second interim and final dividend of 10%, making 20% (same).

Thompson Bros. (Bilston)—Final dividend of 7½% and bonus of 10%, making 25% (same).

Martin Bros. (Machinery)—Final dividend of 12½% and bonus of 5%, making 17½% (same).

Frederick Braby & Company—Final dividend of 7½% and bonus of 2½%, making 12½% (same).

International Nickel Company of Canada—Quarterly dividend of 40 cents on the common stock and an extra dividend of 40 cents (same as a year ago).

Trianco—Net profit for 1947, £26,529 (£24,635); tax, £12,250 (£10,000); to general reserve, £2,500 (£5,000); dividend of 10% (same); forward, £13,460 (£13,231).

Dudley & Company—Net profit to June 30, after administration expenses, depreciation, etc., £33,695; to taxation, £19,597; final dividend of 20%, making 30%; forward, £6,313 (£1,841). The company was registered in November, 1946.

Falk, Stadelmann & Company—Final payment of 5% in the form of a bonus, making a total distribution of 15% (same). The chairman announces that it may be necessary to obtain additional capital in order to finance the company's expanding trade.

Vab Products—Second interim dividend of 7½%, making 12½%. This dividend should be considered as final, and the directors state that the net profit for the year ended December 31, 1947, exceeded that of the previous year. The date of the meeting will be announced shortly.

Ferranti—Net profit for the year ended June 30, after tax, depreciation, etc., £143,388 (£105,293); to general reserve, £100,823 (£60,000); dividend of 6%, tax free (same); forward, £72,822 (£67,507). An amount of £35,177 for provisions no longer required has been added to general reserve account, which, with the allocation of £100,823 from the year's profit, now amounts to £536,000.

Arthur Lee & Sons—Trading profit to July 31, £508,633 (£397,797); income from investments, £11,617 (£10,317); to taxation, £273,321 (£230,767); net profit, £246,929 (£177,347); taxation overprovided, £2,715 (£33,265); to general reserve, £150,000 (£125,000); plant obsolescence reserve, £15,000 (nil); superannuation and retiring reserve fund, £5,668 (£5,922); final dividend of 30%, making 45% (same); forward, £75,309 (£67,298).

Ductile Steels—Trading profit, including rents received and transfer fees, for the year to June 30, £118,355 (£106,841); dividend from subsidiary company, £50,000 (£18,181); to taxation, £82,500 (£58,181); directors' fees and other emoluments, £8,322 (£8,370); auditors' remuneration, £420 (same); depreciation of fixed assets, £12,088 (£12,937); net profit, £65,025 (£45,114); dividend of 45% (dividend of 30% and bonus of 15%); deferred repairs, £18,000 (£12,000); taxation reserve, £15,000 (£10,000); forward, £26,377 (£16,065).

Wright, Bindley & Gell—Consolidated trading profit, dividends, etc., for the period June 29, 1947, to July 3, 1948, £75,239; to depreciation, £8,528; tax, £28,453; directors' emoluments, £6,257; audit, £575; net profit, £31,426; to contingencies reserves: patent £5,815; subsidiaries £5,500, profit retained by subsidiaries £5,603; leaving balance available for parent company, £14,508 (£9,564); to general reserve, £4,000 (£2,000); dividends: preferred ordinary of 7% £4,779, additional 1⅛d. per share £320, deferred 3d. per share £937, suspense £43 (all same); forward, £10,789 (£6,360).

Alexander Hall & Company—Net profit, £70,889; other income, £2,894; to directors' emoluments and fees, £2,500; depreciation, £6,814; income tax, £11,223; profits tax, £7,500; net balance, £45,746; dividend of 5% (same); to writing down investments, £5,000; reserve for income tax, £5,000; reserve for future depreciation of shipyard buildings and workshops, £3,000; reserve for increased replacements costs, £5,000; contingencies, £5,000; provision for taxation, other than income tax, on contracts not completed until after 1946, £10,000; deferred repairs, £5,000; forward, £30,061 (£23,003).

Bellis & Morcom—Consolidated trading profit for the year ended March 31, £38,050; income from trade investments, £3,990; income from other investments. £20,156; to reserve for replacement of fixed assets, £15,000; directors' fees, £1,100; other directors' emoluments, £8,004; tax, £18,479; auditors' remuneration, £863; written off patents, £6,308; net profit, £12,442; profit retained by subsidiary, £344; profit of parent company, £12,098; brought in, £50,940; available, £63,038; to preference dividend, £3,526; final ordinary dividend of 10%, making 14% (same); forward, £32,685.

Trafford Park Estates—Total receipts for the year to June 30, £114,958 (£107,701); net profit, after expenses, depreciation, etc., but before taxation, £96,535 (£78,741); profit on realisation of investments, £2,316 (£66); surplus arising on war-damage compensation claims, £19,086 (nil); interest on war-damage compensation for the period to June 30, 1947, £6,573 (nil);

income tax recovered and over-reserved in respect of previous years, nil (£36,303); to taxation, £59,932 (£51,755); staff benevolent fund, £5,000 (same); dividend of 10½% (dividend of 8% and bonus of 2½%); forward, £121,130 (£99,090).

Henry Norrington & Son—Group net trading profit, £34,403; miscellaneous receipts, £581; deferred repairs reserve written back, £250; to fixed assets depreciation, £1,191; loans and debentures interest, £770; directors' fees, £619; directors' remuneration, £3,000; auditors' remuneration, £450; estimated profits tax, £4,949; income tax, £9,981; to capital increase expenses, £361; lease amortisation provision, £47; capital reserve—subsidiaries' pre-acquisition profit—£6,161; dividend of 22½%, £7,177; forward, £16,724. Parent company profit, £25,311; forward, £16,088 (£11,112). The company was made public in November, 1947.

United Steel Companies—Balance of trading profit for the year ended June 30, including miscellaneous income, £3,935,651 (£3,221,781); income from trade investments, £354,399 (£316,437); income from other investments, £1,152 (£258); estimated E.P.T. recoverable, nil (£175,000); to directors' fees, and other emoluments, £60,599 (£57,582); audit fees, £6,503 (£6,178); interest on loans and debenture stock of a subsidiary company, £31,530 (£42,826); depreciation, £1,104,183 (£1,200,000); income-tax relief in respect of capital expenditure, applied to provision for depreciation, £260,500 (£213,377); pension schemes, etc., £140,000 (£160,000); profits tax, £467,000 (£90,000); income tax, £1,302,000 (£1,110,000); profits belonging to outside shareholders of subsidiary companies, £9,307 (nil); undistributed profits of subsidiary companies, £20,733 (nil); available for appropriation, £888,847 (£833,513); to general reserve, £307,372 (£900,000); central reserve for obsolescence, nil (£125,000); additional provision for depreciation, nil (£750,000); preference dividends, £126,150 (£104,945); final ordinary dividend of 5½%, making 8% (same); forward, £613,485 (£606,696).

Development of West Midland Industry

A plan for the development of the West Midlands, including proposals for the redistribution of population and the decentralisation of industry, was issued on November 1 by the Ministry of Town and Country Planning. The plan, which covers Warwickshire, Worcestershire and South Staffordshire, is, in the main, the work of Prof. Sir Patrick Abercrombie and Mr. Herbert Jackson, chief consultant appointed by the Ministry.

The economic and natural advantages of the West Midlands, it is stated, are second only to Greater London as a built-up area, a producer of wealth, and a magnet for industry and population. From about 3,400,000 in 1947 the region's population is expected to grow by immigration and natural increase to 3,785,000 by 1962. General metal industries are likely to be the backbone of employment and will grow just as much in the future as in the past. Electrical engineering is also expected to expand, but the load is conveniently spread because part of the growth will be in Rugby, Coventry and Stafford. Iron and steel tubes and bolts and nuts also may expect some increase in space and personnel.

United Steel Companies' Record Output of Steel

Compensation for Wagons

Steel production by the United Steel Companies, Limited, in the year ended June 30, 1948, totalled 1,896,229 tons—a record for the organisation. The production of pig-iron amounted to 1,056,860 tons and exceeded that of the previous year.

The annual report states that there is little further to report as to assets vested in the N.C.B. Partial compensation has been received for the stocks which were transferred, but nothing has yet been received for the railway wagons taken over at the vesting date by the N.C.B. and distribution of the global sum of compensation cannot be expected for a long time. On the other hand, the report continues, compensation has been received for the wagons which vested in the Transport Commission on January 1, 1948. The surplus over their book value after providing for taxation liability which, as the law stands, will arise thereon has been added to the accumulated provision shown on the balance sheet for depreciation.

The work of modernising and extending the works of the company and its subsidiaries has continued and expenditure on capital account during the year amounted to £4,459,302. Some schemes have already been completed and have resulted in improved efficiency, reduced costs and greater output. Work on the large developments still to be completed has made substantial progress, but the shortage of labour and materials is still a handicap.

A summary of the consolidated profit and loss account of the United Steel Companies, Limited, and its subsidiary companies appears in the previous column. The form of presentation of the accounts has been modified to meet the requirements of the Companies Act, 1948, but for the purpose of comparison a corresponding rearrangement of the figures for the previous financial year has been made.

Gazette

T. TOWARD & COMPANY (1932), LIMITED, tank and boiler manufacturers, etc., is being wound up voluntarily.

BREARLEY INGOT COMPANY, LIMITED, is being wound up voluntarily. Mr. E. J. Gadsby, 66, Bridge Street, Sheffield, 3, is the liquidator.

MR. J. B. SANDERSON, 17, Museum Street, Ipswich, has been appointed liquidator for the winding-up of Jay-Vee Engineering Products, Limited.

GLOBE MACHINES, LIMITED, is being wound up voluntarily. Mr. H. C. Rudolf, Finsbury House, Blomfield Street, London, E.C.2, is the liquidator.

RUSKIN ENGINEERING COMPANY, LIMITED, is being wound up voluntarily. Mr. F. G. Stephens, 77, Harborne Road, Edgbaston, Birmingham, is the liquidator.

QUICK SUPPLY, LIMITED, capstan repetition workers, of Birmingham, is being wound up voluntarily. Mr. P. Phillips, 76, New Cavendish Street, London, W.1, is the liquidator.

Personal

MR. J. PITCHERS has been appointed a director of S. E. Opperman, Limited, engineers and gear cutters, of Boreham Wood, Elstree, Herts.

MR. HENRY GARDNER, of Glenfield & Kennedy, Limited, hydraulic engineers and founders, has been elected president of the Kilmarnock Chamber of Industries.

DR. L. G. H. HUXLEY, acting head of the Department of Electrical Engineering at Birmingham University, has been appointed to the Chair of Physics at Adelaide University.

MR. ALEX AIKMAN, a director of the Grangemouth Dockyard Company, Limited, has been appointed a director of the North-West Rivet Bolt & Nut Factory, Limited, Airdrie.

MR. J. C. BIDGOOD, a director of Edward Bidgood & Company, Limited, structural engineers, etc., of Leeds, has been adopted as prospective Conservative candidate for North-East Leeds.

MR. D. M. BROWN, of Babcock & Wilcox, Limited, engineers, boilermakers, etc., of Renfrew, has been appointed vice-chairman of the Scottish Advisory Council on Industrial Salvage and Recovery.

MR. A. DOWDELL, formerly personnel manager of the Yorkshire Copper Works, Limited, Leeds, has been appointed Lecturer in Industrial Administration at the College of Technology, Manchester University.

MR. JAMES LOCHHEAD, manager of the Reid Gear Company, Linwood, Renfrewshire, has received a presentation to mark the occasion of his retirement after more than 50 years' service with the company.

SIR GEORGE USHER, chairman of Aberdare Cables, Limited, and Aberdare Cables, South Africa, Limited, and managing director of International Combustion, Limited, left England on November 4 for an extended business visit to South Africa.

MR. J. B. GWYNNE LEWIS, manager of the Cardiff office of George Ellison, Limited, manufacturers of electric switchgear, etc., has resigned after 30 years' service with the company. He will be succeeded by MR. A. G. K. WILLIAMS, assistant manager at Cardiff.

SIR ROBERT ROBINSON, F.R.S., president of the Royal Society, and MR. W. L. TREGONING, industrial adviser to the Finance Corporation for Industry, Limited, have joined the board of Petrochemicals, Limited. Sir Robert Robinson has also joined the board of Petrocarbon, Limited, an associated company.

MR. JOHN ALCOCK, joint managing director of the Hunslet Engine Company, Limited, Leeds, flew to Johannesburg last week. During his stay in South Africa he will visit mines and sugar plantations to advise on haulage problems, especially in connection with the use of Diesel locomotives.

MR. HAROLD E. SHEARDOWN, chairman of Charles D. Holmes & Company, Limited, Hull, has been elected chairman for 1948-49 of the National Association of Marine Enginebuilders, with SIR PHILIP JOHNSON, a director of R. & W. Hawthorn, Leslie & Company, Limited, Newcastle-upon-Tyne, as vice-chairman.

MR. F. E. CHAPPELL, who, as Director of the Production Efficiency Service of the Board of Trade, was the leader of 32 production engineers and industrial experts advising British firms on how to increase their production, has resigned his post. Mr. Chappell, who is 54 years old, said on October 30 that he had resigned because his views were "not acceptable" to the Board.

MR. D. E. WISEMAN has resigned the joint managing directorship of Short Bros. & Harland, Limited, aeronautical engineers, but is retaining his seat on the board. REAR-ADMIRAL M. S. SLATTERY, hitherto joint managing director, becomes sole managing director. MR. E. B. BOWYER has resigned from the board due to pressure of other work, and MR. F. C. How, Under-Secretary, Ministry of Supply, has been appointed to fill the vacancy.

MR. J. W. LAING has been appointed chief engineer of the Witton Engineering Works of the General Electric Company, Limited. He served his apprenticeship with C. A. Parsons & Company, Limited, Newcastle-upon-Tyne, after which he was engaged in the company's electrical design office. In 1929, he joined the engineering design staff of the G.E.C. at Witton as senior turbo-alternator designer and was responsible for all synchronous machines. Mr. Laing returned in 1935 to C. A. Parsons & Company as senior electrical design engineer, later being appointed deputy chief electrical engineer.

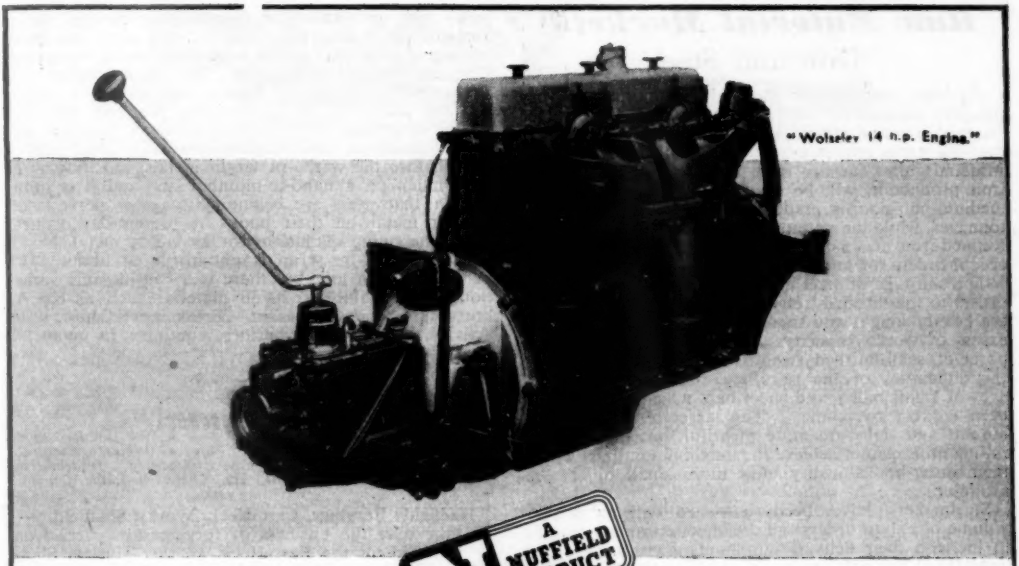
Wills

NUTTALL, W. D., of Arthur Lee & Sons, Limited, steelmakers, of Sheffield	£2,667
MARTINDALE, R. R., of Kent, deputy chief engineer of the British Electricity Authority	£15,872
KENWORTHY, J. T., of Bristol, a member of the Council of the Institution of Production Engineers ...	£6,983
COUPER, JAMES, founder of James Couper & Company, Limited, structural steelworkers, etc., of Croydon	£16,803
CHARLTON, R. B., managing director of H. Blackett Charlton & Company, Limited, non-ferrous founders, of Newcastle-upon-Tyne	£117,587

Australian Iron Deposits

Three public companies were registered at Perth recently, their objects being to develop the large iron deposits at Yampi Sound, in the North-West of Western Australia, and to commence an integrated steel fabricating industry in the State. The companies are:—Western Steel Enterprises (nominal capital, £2,500,000); Westeel Pty. (£2,000,000); W.A. Coal Mines (£250,000).

It is expected that the annual steel production will be between 12,000 and 15,000 tons. The State Government has a substantial interest in the project, and the Federal Government will be approached to permit shipment of iron ore to the United States in return for machinery.



Using

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ENGINEERING CASTINGS

THE STANTON IRONWORKS COMPANY LIMITED, Nr. NOTTINGHAM

Raw Material Markets

Iron and Steel

Pig-iron supplies for the light foundries are very meagre; allocations are inadequate and deliveries of licensed tonnage remain uncertain. There is no doubt that the extra output expected from the transfer of a Midlands blast furnace from basic to high-phosphorus iron production will be eagerly absorbed. Low- and medium-phosphorus grades are also wanted in larger tonnages, while the output of hematite is fully absorbed. Refined-iron makers, however, are still in a position to accept orders for immediate tonnages.

The shortage of steel has diverted quite a number of orders to the finished-iron works. Best and crown bars are keenly sought and there are export inquiries far in excess of works' capacity. Substantially increased imports of semi-finished steel from Belgium have eased the difficulties of the re-rollers, but there are shortages of small billets and sheet bars which have not yet been entirely overcome. The larger sizes of billets, blooms and slabs are more plentiful, but the light re-rolling mills cannot achieve the maximum outputs which their order-books justify until more small billets are available.

Steelmakers have been entrusted with a bigger volume of export orders and are under constant pressure to increase their deliveries to home consumers. It is understood that extra tonnages of plates, etc., have been promised to Sweden, and although these are to be spread over a period of 12 months, they will necessarily involve further encroachment on the weight of material available for distribution to home consumers. Joists, channels, sections and steel rails are also heavily booked and sheetmakers are rather overwhelmed by the volume of business on offer, both for home consumption and for export. Wire and strip mills are also fully engaged and there is a swelling demand for special steels.

Non-ferrous Metals

Last week brought an advance of 2 cents per lb. in the price of lead in New York, the quotation now being 21½ cents and, therefore, close to the copper price of 23½ cents. Consequently, the United Kingdom sterling quotation of £112 per ton is threatened, but it is unlikely that any upward adjustment will take place before the end of the year at the earliest; with a quarterly allocation scheme in force the Ministry of Supply knows that consumers can only purchase a certain fixed tonnage of lead. Secondary lead in the form of scrap and remelted pig is in fairly good supply, but relatively high prices are being paid. The virgin-metal supply position is tight and stocks are satisfactory, even in the light of the relatively small monthly usage permitted. At this abnormally high price, however, there is a great probability that the use of the metal is being affected adversely and, as the price climbs higher, this factor will be more and more prominent in the situation.

To the consumer of non-ferrous metals, scrap remains, as it has for some months past, the most attractive purchase, and it is perhaps rather surprising that more is not being sold. But manufacturers are undoubtedly seeking to reduce their stocks, a policy dictated partly by the approaching year-end, but also by the exigencies of the present situation, in which the cost of financing metal holdings is so very much higher than before the war. In virgin metals, too, buying is very much on a hand-to-mouth basis, and it is quite certain that users are beginning to grow nervous of putting metal on their books at present-day values. As to the ruling quotations for secondary metal, No. 1 H.C. copper wire scrap is obtainable at about £115 per ton or even less, but there is a considerable variation in the value of 70/30 material such as S.A.A. brass cases and Q.F. cases. Brass ingots show little activity, but an export business continues in gunmetal ingots.

New Companies

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Hadfields Forgings, East Hecla Works, Sheffield, 9—To take over the business of forgemasters carried on by Hadfields at the East Hecla Works, Tinsley, Sheffield, and at the Hecla Works, Attercliffe, Sheffield. £100. W. J. Gibson.

Hadfields Foundry & Engineering Company, East Hecla Works, Sheffield, 9—To acquire the part of the business of Hadfields at the East Hecla Works, Attercliffe, Sheffield, comprising the steelfoundry, heat-treatment, hardening, and general engineering departments. £100. W. J. Gibson.

Hadfields Steels, East Hecla Works, Sheffield, 9—To acquire the steelmaking part of the undertaking of Hadfields at the East Hecla Works, Tinsley, Sheffield (including the rolling mills directly related to the production of rolled products, but excluding the manufacture of castings and highly-alloyed steels). £100. W. J. Gibson.

MR. H. E. HAND, who is retiring after 35 years' service with J. Stone & Company, Limited, engineers and foundrymen, of Deptford, London, S.E.14, was entertained at dinner on October 29. Since 1918 Mr. Hand has been head of the company's chemical laboratories.

THE CHAIRMAN and directors of William Jacks & Company, Limited, Winchester House, Old Broad Street, London, E.C.2, entertained their staff and friends at a dance at Caxton Hall, Westminster, on October 28. Mr. J. Gray Buchanan, chairman, announced that the competition held that evening had produced £12 10s. for the Industrial Co-partnership Association. A cable of good wishes was received from Mr. W. G. Buchanan, managing director, who is presently visiting the firm's branches in India, Pakistan, Burma, Malaya, and China.